

## Pedestrian Injuries to Young Children

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In 1899, there were only a few hundred motor vehicles in the United States, but one in New York City managed to strike a man and killed him. This was the first pedestrian death in North America caused by a motor vehicle. Today, motor vehicles are ubiquitous. In 1998, in the United States, 215 million registered vehicles traveled more than 2.6 trillion miles (1). Pedestrian injuries now happen every day, killing nearly 5,000 Americans each year. Roughly 10 percent of these are Californians (2). In less than 100 years, motor vehicle pedestrian injuries have evolved from a rare curiosity into a public health problem.

The purpose of this report is to provide a basic, clear description of child pedestrian injuries: How many? At what ages? When? And where? Subsequent EPICgrams will examine specific policy questions and other age groups at risk such as older adults.

In this report we look at pedestrian injuries involving children, because they are especially vulnerable to being hit or run over by vehicles.

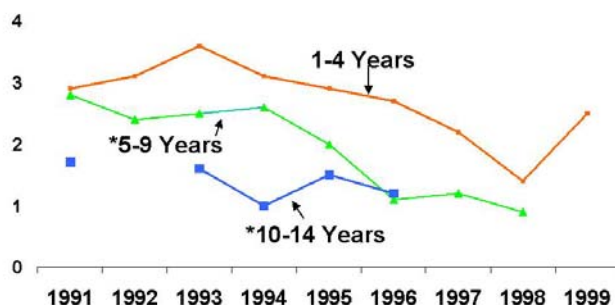
California children under age 15 are seriously injured or killed by a car at a rate of nearly four per day (3,4). Pedestrian injuries are the third leading cause of injury death among these children and the fourth leading cause of serious nonfatal injury hospitalizations. Pedestrians account for about 30 percent of motor vehicle-related deaths among children under 15.

### The Pedestrian Injury Problem

#### How Many Are Injured?

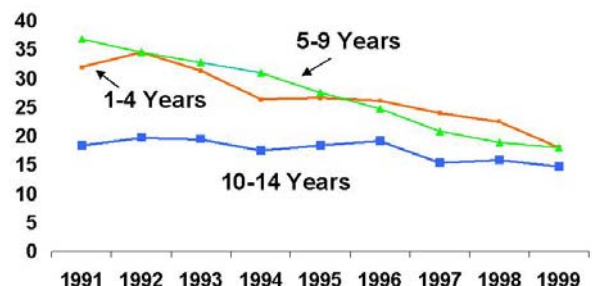
In the nine-year interval, 1991 through 1999, 15,319 Californians under the age of 15 were hospitalized for nonfatal injuries after being hit by a car. In that same period, an additional 1,183 children died from such injuries. Figures 1 and 2 show pedestrian injury rates by age group over the nine-year period. Overall death rates (per 100,000 population) fell from 2.3 in 1991 to 1.2 in 1999 – a 48 percent rate decrease. Nonfatal injury rates declined 41 percent, from 27 percent in 1991 to 16 percent in 1999. The most significant decrease in rates of killed and severely

Figure 1.  
Fatal Pedestrian Injury Rates, by Age Group  
California, 1991-1999



Source: California Office of Statewide Planning and Development  
Rates per 100,000 (\*rates not computed for less than 20 deaths: 1992, 1997-99)

Figure 2.  
Non-fatal Hospitalized Pedestrian Injury Rates,  
by Age Group  
California, 1991-1999

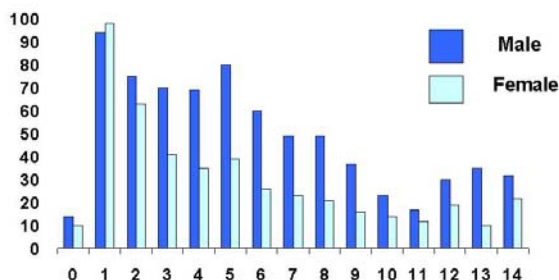


Source: California Office of Statewide Planning and Development  
Rates per 100,000 (rates not computed for less than 20 deaths)

injured children occurred among the 5-9 year-olds. The highest rates continue to be among the 1-4 year-old age group for both fatal and nonfatal injuries.

Age and sex are important. When we look at number of deaths by single year of age (by sex) we see that the number of injuries rises quickly after infancy, then gradually falls (Figure 3). At about age 12, the numbers rise again. Most of the victims are boys. Beginning at age three years, boys outnumber girls as pedestrian fatalities by almost 2:1. Nonfatal pedestrian injuries (not shown) follow a similar pattern.

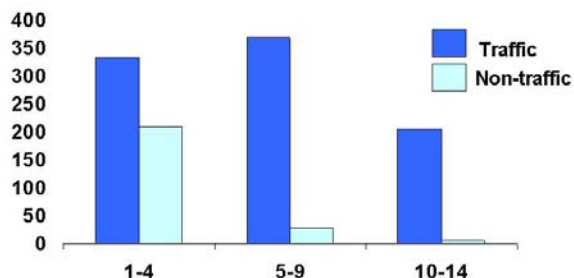
**Figure 3. Fatal Pedestrian Injuries, by Age and by Sex, 1-14 Yrs. California, 1991-1999**



Source: California Department of Health Services, Death Records

Age differences surely have something to do with how youngsters are exposed to cars. Many of the injuries to toddlers and preschoolers are “nontraffic,” meaning they occur in places like driveways and parking lots instead of on public roads (Figure 4). Nontraffic

**Figure 4. Fatal Pedestrian Injuries, by Age Group and Traffic Type, 1-14 Yrs. California, 1991-1999**



Source: California Department of Health Services, Death Records

injuries are common among children less than age five but are much less common in grade schoolers and almost disappear by middle school. Over one-half (168/304) of all fatal nontraffic pedestrian injuries occur among toddlers (ages 1-2 years).

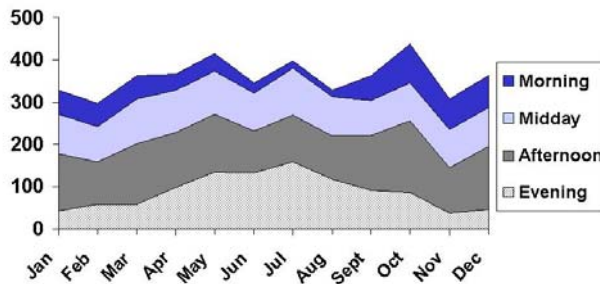
## What Does a Typical Injury Look Like?

In 1999, an average pedestrian injury resulted in a 2-day hospital stay and over \$25,000 in hospital charges. Nearly one-third (32 percent) of the hospitalizations were for injuries to lower extremities, and most of these (87 percent) were fractures. One-quarter of nonfatal hospitalizations was for a traumatic brain injury. While we do not have data on care following a child’s hospital stay, we do know that 14 percent of these children do not go directly home, but rather require additional care and are transferred to other facilities.

## When and Where Do Injuries Occur?

Child pedestrian injuries are clustered at certain times of the day. CHP data indicate that the most common time for injuries to occur was from 3:00 p.m. to 6:00 p.m. (35 percent) (5). This mid to late afternoon period was the most common time for both weekdays and weekends, suggesting children at play. There was seasonal variation. During the summer months there were more injuries in the evening hours (Figure 5). Since children have to get to and from school, they may be exposed as “commuters,” particularly if they walk to school, but also as they walk to and from the buses and cars that take them to school. Among school-aged children (ages 5-14 years), 21percent were injured during the weekday morning commute hours (6:00 to 9:00 a.m.) compared to less than 1 percent at this time on weekends. Nearly one-third (30 percent) of the injuries were among children hit while crossing the street in a crosswalk. There were age differences. 40 percent of youngsters ten years and older were in a crosswalk compared to 23 percent of schoolagers under age ten. 20 percent of children under the age of five were hit while in a crosswalk.

**Figure 5. Number of Pedestrian Injuries, by Month and by Time of Day  
Ages 14 Years and Younger, California, 1999**



Source: California Highway Patrol, SWITRS Data

What does this information tell us?

The important question is this: Can we do better? If we have not yet taken all reasonable steps, if we have not reached the practical limits of what policies and education can do, then the data can help guide action. Let us look at the data in this light:

- The numbers are falling. This suggests we can bring them down further, that we haven't reached the end of what we can do. The decline in injuries may be, in part, due to fewer people walking. A Department of Transportation study reports a nationwide decline in walking between 1977 and 1995 (6).
- Toddlers and preschoolers have particularly high risk, and nearly half of their injuries take place in "nontraffic" settings, such as driveways. Many of the nontraffic injuries are a result of a vehicle backing over a child. Research at the University of California at Irvine and elsewhere makes it clear that very small children simply lack the experience and neurological development to perceive and avoid certain dangers, such as a moving vehicle (7, 8, 9).
- School-age children are different from preschoolers. They may be better able to assess and avoid dangers, but they also range further from home, typically playing on or near residential streets and even crossing and walking along busy highways. An 8-10 year-old child may still need adult supervision crossing the street. They are often hit when they enter the street suddenly

midblock (10). Many injuries to these children occur during morning and evening commute hours and at hours when they are typically at play.

## What Next? The Three E's of Injury Control

The most successful prevention efforts include a combination of the following:

**Education:** Help people understand the risks children face and what they can do about them. For example, many experts believe that parents do not always appreciate that small children simply lack the neurologic and social development to safely deal with the danger of moving vehicles. Yet, these children have the motor skills to access traffic. Parents can be taught the developmental limits of their children. In the home, measures can be taken to decrease the risk of children getting out unattended or unsupervised.

**Engineering:** Create safer environments. Traffic engineers and concerned citizens constantly look for ways to separate people from cars, to slow or "calm" traffic in areas pedestrians use, and improve street crossings.

**Enforcement:** Law enforcement plays an important role in ensuring compliance with traffic laws designed to protect pedestrians. Speeding, red light-running, and impaired driving are documented—and illegal—threats to people on foot. Pedestrians are also obliged to obey laws designed to keep them safe, although children's compliance is the responsibility of parents and other adults.

## Conclusion

Pedestrian injuries are one of the most common injuries among young children – yet they are preventable. Every year, hundreds of California children are injured, some fatally, because a car hit them. While the rates of serious injury and death are lower than they have been for several years, it may be partly because people are walking less, or because injured pedestrians get better emergency care.

To further reduce these injuries we need to know more about how many children walk regularly, who is

getting hurt, where they live and what the conditions are on the streets where they live and play. We need to target programs to the specific patterns of risk for children at different stages of development.

## DATA AND METHODS

### Data

In this report we use three sources of data to describe the magnitude, demographic and situational risk factors associated with pedestrian injuries: death certificates, hospital discharge records, and police traffic reports. The death records tell us about the cause of injury death and provide information such as age, gender and race/ethnicity. The hospital records give us the cause of injury and describe some of the medical aspects of the injury. In addition, limited demographic information is available from the hospital records. California Highway Patrol's (CHP) compilation of police traffic reports (SWITRS data) provide details on the location and circumstances of collisions on public roads.

### Definition

In this report pedestrian injuries are defined as an injury to a pedestrian caused by a motor vehicle – whether on public streets and highways or on private property or other nontraffic location. A pedestrian is any person walking, or in/on a pedestrian conveyance such as roller blades, a baby stroller or a wheelchair. We considered hospital discharge and death records with an underlying cause of death ICD9 code (deaths) or an external cause of injury ICD9 code (hospitalizations) of E810.7, E811.7, E812.7, E813.7, E814.7, E815.7, E816.7, E817.7, E818.7, E819.7, E822.7, E823.7, E824.7, and E825.7. For 1999 death records, we included injuries with an ICD10 code of V02.0, V02.1, V02.9, V03.0, V03.1, V03.9, V04.0, V04.1, V04.9, V09.0, and V09.2. Police collision records indicating a pedestrian victim were included in the analysis of SWITRS data.

### Injury Rates

For reported categories, injury rates were only calculated when there were 20 or more injuries or deaths.

For more information on pedestrian injuries in California or in a specific county, visit our website: [http://www.dhs.ca.gov/epic/html/injury\\_data.html](http://www.dhs.ca.gov/epic/html/injury_data.html).

## References

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## EPICgram



The California Department of Health Services, Epidemiology and Prevention for Injury Control (EPIC) Branch publishes EPICgram to inform the public about injury patterns, prevention programs, and opportunities to protect the lives and health of all Californians.

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